

Go Solar

Install a solar system with help from Generation Partners



Enough solar radiation strikes the earth every day to meet our energy needs for a whole year. Solar is an abundant resource in the Tennessee Valley. In fact, the Valley's solar energy potential is 50 percent greater than that of Germany, a world leader in solar photovoltaic (PV) installations.

Generation Partners, brought to you by TVA and your local participating power company, provides technical support and incentives for installing a PV system at your home or business.

HOW SOLAR WORKS

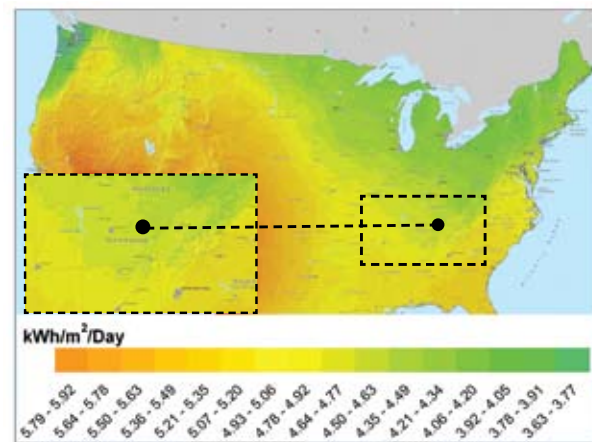
PV systems consist of solar panels, which are assemblies of solar cells that convert sunlight to electricity. When sunlight strikes a cell, electrons in the solar cells are excited and create an electrical current.

SOLAR IN THE VALLEY

PV systems work anytime the sun is shining, but they produce a greater amount of electricity when the sun is more intense and strikes the panels directly. The Tennessee Valley region receives adequate sunlight to provide a consistent source of solar energy, as shown on the solar resource map at right. However, certain conditions have to be met for greatest efficiency. The panels:

- Should be facing south and tilted to the line of latitude.
- Must be in full view of the sun all year round. Having even a small portion of the panels in the shade may cause a significant decline in output.
- Are generally mounted on the roof for maximum sun exposure. However, locating them in a position where air can flow underneath allows them to operate more efficiently.

Photovoltaic Solar Resource of the United States



*Edited with permission by the National Renewable Energy Laboratory, NREL. (2010)
 "Renewable Energy Technology Resource maps for the United States." www.nrel.gov*

Calculating solar energy output

1. Determine the daily solar radiation for your area using the Solar Resource Map.
2. Multiply this value by 365 (days/year).
3. Multiply this value by 0.8 (correction factor).
4. Multiply this value by the nameplate PV system size.

**Annual Tennessee Valley solar energy output (AC)
 for a 1 kW system is 1,150 to 1,400 kWh per year.**

FINANCIAL INCENTIVES

The cost of an installed PV system is typically about \$7,000 to \$9,000 for a one-kilowatt (kW) system. TVA and your local power company will pay a one-time incentive of \$1,000 toward the cost of the system. Federal and state incentives can further reduce your cost, although incentives can vary by state. For information, go to www.dsireusa.org.

POWER PAYMENTS

Generation Partners guarantees a 10-year payment at the utility rate (retail rate for residential; GSA1 rate for commercial) plus an additional 12 cents per kilowatt-hour (kWh) for the power you generate. If utility rates increase or decrease, so does your payment.

SYSTEM COST: RESIDENTIAL EXAMPLE (applicable for Tennessee)	
System Size: 2.5 kW	Initial Cost: \$20,000
Net cost after incentives	\$13,000*
Estimated annual energy production	3,125 kWh**
Estimated annual generation credit	\$687.50***
<small>* Assuming 30% federal tax credit + \$1,000 (TVA). ** Assuming 1,250 kWh/kW (see equation below for more detail). *** Assuming \$0.22/kWh generation rate.</small> Typical system size for residential is 0.5 - 10 kW.	

SYSTEM COST: COMMERCIAL EXAMPLE (applicable for Tennessee)	
System Size: 25 kW	Initial Cost: \$200,000
Net cost after incentives	\$86,500*
Estimated annual energy production	31,250 kWh**
Estimated annual generation credit	\$7,187.50***
<small>* Assuming 30% federal tax credit + TN grant + \$1,000 (TVA) (TN grant is taxed at 30% tax rate, equipment depreciation not calculated). ** Assuming 1,250 kWh/kW (see equation below for more detail). *** Assuming \$0.23/kWh generation rate.</small> Typical system size for commercial is 10 kW and above.	

A CLOSER LOOK AT SOLAR TECHNOLOGY

Efficiency and installation size

The higher the solar panel efficiency, the less space required to install the PV system. The graph at top right compares area requirements of different solar module efficiencies of equivalent nameplate power values.

Calculating solar energy production

$$AEO = SSNPV \times ASR^{1,2}$$

AEO = Annual energy output (kWh/year)

SSNPV = Solar system nameplate value (kWdc)

ASR = Annual solar radiation (kWhac-yr/kW)

¹ Determined from Solar Resource Map

² Assumes 0.8 correction factor has been applied

ROOF AREA NEEDED IN SQUARE FEET (shown in bold type)							
PV Module Efficiency (percent)	PV Capacity Rating (kilowatts)						
	1	5	10	50	100	500	1,000
4	300	1,500	3,000	15,000	30,000	150,000	300,000
8	150	750	1,500	7,500	15,000	75,000	150,000
12	100	500	1,000	5,000	10,000	50,000	100,000
16	80	400	800	4,000	8,000	40,000	80,000
For example, to generate 5 kilowatts from a 12 percent-efficient system, you need 500 square feet of roof area.							

Heat and performance relationship

Although solar panels need the sun to function, higher ambient temperatures caused by solar radiation actually reduce the panels' electrical performance. As a result, PV panels that are directly mounted on a roof structure (building-integrated PV) are less efficient than panels installed in a location with abundant airflow. For crystalline silicon, you lose about 0.5 percent of the PV electrical performance per 1.8°F.

Solar tracking

One-axis tracking (east to west) can increase production by 24 percent and two-axis tracking by 30 percent. Although solar tracking greatly increases the amount of energy produced, it comes at a higher initial cost and involves mechanical components that degrade over time.

Maintenance and warranty

PV panels without tracking require no maintenance and typically come with a 25-year electrical performance warranty and a five-year mechanical equipment guarantee. Inverters typically come with a 5- to 10-year manufacturer's warranty and may need to be replaced once during the warranty period of the PV panels.

MORE INFORMATION

Learn more about solar power and how you can help the environment by becoming a Generation Partners participant.

Generation Partners: www.generationpartners.com

Consumer guide to home solar:

www.nrel.gov/docs/fy09osti/43844.pdf

Solar energy info: www.solarpanelinfo.com

Find a solar professional: www.findsolar.com

Regional solar calculator: www.pvwatts.org

Certified energy practitioners: www.nabcep.org